

# PATENT SPECIFICATION

DRAWINGS ATTACHED

L147,378



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Date of filing Complete Specification: 29 June, 1967.

Application Date: 19 Dec., 1966.

Na. 56713/66.

Complete Specification Published: 2 April, 1969.

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Index at acceptance: —G5.C(67, 69A, 70C, 70D)

## ERRATA

SPECIFICATION No. 1,147,378

Page 1, line 73, for "Other" read "Others"

Page 2, line 15, for "contains" read "containers"

Page 2, line 118, for "tormadoes" read "tornadoes"

Page 3, Agents address, for "224, Worpole Road" read "224 Worpole Road"

THE PATENT OFFICE  
3rd June 1969

20 another liquid or liquids to effect localised changes in the chemical and/or physical condition of the liquid.

25 According to one embodiment of the invention a transparent cell is filled with a liquid containing one or more pH sensitive compounds, such as phenolphthalein or thymol blue, and provision is made for pumping in dilute solutions of acid and/or alkali through jets submerged in the liquid to produce localised colour changes which can be caused to mix with the rest of the liquid in the cell to produce a moving modern art abstract "painting" in brilliant contrasting colours. For thymol blue a concentration of 0.005% in water has been used. Industrial methylated spirit may be added in the case of phenol phthalein in view of its poor solubility in water.

35 The scope of the monopoly is defined by the appended claims; and how the invention can be performed is hereinafter particularly described, with reference to the accompanying drawing which shows by way of example only, one form of cell which may be utilized in carrying out the present invention.

THE JETS ARE INSERTED INTO THE GATE 14.

65 The jets may be of any desired diameter or shape which can be incorporated in the sides of the cell, for example slit shaped jets for producing ribbons of colour. They may be made of non-corrodible metal or of rigid plastics; for example, brass, copper, stainless steel, polymethyl methacrylate, polystyrene, polyalkenes. The jets may be disposed at any angle at any point around the cell. Jets which pass through the lid, but which do not dip into the solution, can be used to drop liquid into the solution to cause vortex rings of colour ("smoke" rings). Other injecting liquids horizontally along the sides of the cell in the light path would give aurora effects. Jets injecting liquid vertically and onto the sides of the cell produce orchid shapes.

75 Many other more complex phenomena can be made to occur by operating combinations of jets simultaneously.

80 The piping connected to the jets may be of any suitable material which is supple, does not kink or tangle and is chemically resistant; for example, polyvinylidene tubing of 1/16" internal diameter and 1/16" wall thickness.

SEE ERRATA SLIP ATTACHED

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Int. Cl.: —B 44 f 1/10, G 09 f 13/24

## COMPLETE SPECIFICATION

### Apparatus for Producing Varied Illumination Effects

I, CHRISTOPHER JOHN DAVIS, of 21, Wandle Road, Morden, Surrey, a British subject, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to apparatus for producing varied illumination effects when light is projected through a body or film of coloured liquid. The invention is also concerned with adapting apparatus to a projector so that the coloured liquid phenomena may be projected on to a screen.

The varied phenomena are initiated by the injection into the body of liquid from one or more of a plurality of different angles of another liquid or liquids to effect localised changes in the chemical and/or physical condition of the liquid.

According to one embodiment of the invention a transparent cell is filled with a liquid containing one or more pH sensitive compounds, such as phenolphthalein or thymol blue, and provision is made for pumping in dilute solutions of acid and/or alkali through jets submerged in the liquid to produce localised colour changes which can be caused to mix with the rest of the liquid in the cell to produce a moving modern art abstract "painting" in brilliant contrasting colours. For thymol blue a concentration of 0.005% in water has been used. Industrial methylated spirit may be added in the case of phenolphthalein in view of its poor solubility in water.

The scope of the monopoly is defined by the appended claims; and how the invention can be performed is hereinafter particularly described with reference to the accompanying drawing which shows by way of example only, one form of cell which may be utilized in carrying out the present invention.

The cell shown may be made of any suitable transparent material such as plastics, for example polymethyl methacrylate, of appropriate thickness and may comprise a U-shaped member 10 about  $\frac{3}{4}$  inch wide closed by two side pieces 11, 12 and a removable lid 13. 14 represents the gate of a projector having a condenser lens 15. Jets 16 extend through the walls of the cell at any number of points desired and are connected via tubing 17 to appropriate supplies and controls. An overflow is provided at 18 and a breather hole 19 in the lid. The lid 13 has an arch spring 20 to hold the flush fitting lid in place when the cell is in the gate. Flanges 21 protect the tubing 17 and jets 16 and locate the cell when it is inserted into the gate 14.

The jets may be of any desired diameter or shape which can be incorporated in the sides of the cell, for example slit shaped jets for producing ribbons of colour. They may be made of non-corrodible metal or of rigid plastics; for example, brass, copper, stainless steel, polymethyl methacrylate, polystyrene, polyalkenes. The jets may be disposed at any angle at any point around the cell. Jets which pass through the lid, but which do not dip into the solution, can be used to drop liquid into the solution to cause vortex rings of colour ("smoke" rings). Other injecting liquids horizontally along the sides of the cell in the light path would give aurora effects. Jets injecting liquid vertically and onto the sides of the cell produce orchid shapes.

Many other more complex phenomena can be made to occur by operating combinations of jets simultaneously.

The piping connected to the jets may be of any suitable material which is supple, does not kink or tangle and is chemically resistant; for example, polyvinylidene tubing of 1/16" internal diameter and 1/16" wall thickness.

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Alternative materials would be PVC or poly-alkene.

The cell may be filled with liquid and emptied by any suitable means. One form of device would be a polythene squeeze bottle with filling and emptying pipes leading from it. By closing the emptying pipe and squeezing the bottle a syphon action may be started down the filling pipe to the cell and, conversely, by closing the filling pipe and then squeezing and releasing the bottle liquid may be syphoned out of the cell. The emptying system may include a filter.

The piping from some of the jets may be connected to reagent contains via bulb pumps, for example. The piping from other jets may be connected to rubber bulbs, which may be used as pulsers after first ejecting any air in the bulb.

All the rubber bulbs may be located, and clamped, in grooves in a console and may be operable by individual keys. All the bulbs may be compressed simultaneously when desired by depressing a commoning bar. This action could also raise the back of the console to aid the escape of any air from the bulbs.

Diaphragm pumps could be used, in place of rubber bulbs, with key boards resembling piano keys.

Regarding the solutions to be used, different combinations of dyes are found to give a great variety of colour effects. The dye concentrations may be maintained by incorporating dyes in the acid and alkali solutions, or the dye combination may be changed completely over a period of time by injecting solutions containing other dyes. For hydrochloric acid and sodium hydroxide solutions a concentration of about 0.3 normal has been found adequate.

As a variant to changing the hydrogen ion concentration of the liquid in the cell, and so changing the colour of the pH sensitive compound, action may be taken to produce localised changes in the density and refractive index of the liquid by the addition of liquids of greater or lesser density, for example saturated salt solution and/or industrial methylated spirit. Careful injection of such solutions may be caused to create a density gradient which will give layering of colours and slow moving waves at the interface of the layers.

Heating the cell at any point causes liquid adjacent to that part of the cell wall to rise slowly. The initial movement is smoother and more graceful than can be achieved solely by jets. Small low voltage remotely controlled electric heaters disposed either inside or outside the cell may be used for this purpose.

On the other hand, heat filters are advantageous to prevent the heat from the projection lamp causing unwanted thermal currents in the cell liquid. An adjustable heat

filter could be incorporated so that controlled thermal currents could be generated, when desired, to give the effect of an aurora.

Heat filters equivalent to one inch depth of water are found to be sufficient to absorb the infra red rays from lamps up to 500 watts.

Quartz iodine lamps are most suitable because of their higher light-to-heat output ratio.

As it is undesirable to have the images of dust fibres, and other solid floating material projected on the screen, it is preferable that all solutions be filtered before entering the cell. The filling bottle already described would filter the bulk of the liquid. Liquid from the pumps could be passed through filters in the pipes leading to the jets to ensure freedom from dirt. Air finding its way out of jets and adhering to the cell walls gives an unsightly projection. The addition of a few drops of detergent per 100 ml of each solution prevents these bubbles adhering to the sides of the cell.

The invention is not limited to the foregoing details, which are given by way of example, as various modifications may be made to suit requirements.

For example, solutions of coloured substances sensitive to qualities other than pH value, for example, chloride concentrations could be used. Also non-aqueous solutions could also be used for non-water soluble dyes.

Further, a selection of colour filters of any density and colour have been used to change the colour mood of the display as desired by placing them in front of the projection lens.

As regards cell construction, cells  $1\frac{1}{2}$  inches square to  $3\frac{1}{2}$  inches square are found to be equally effective. They may be moulded in one or more pieces from any suitable transparent plastics, for example Diakon (Registered Trade Mark) or polystyrene, complete with jets, or with holes into which jets may be cemented. Glass may be used where the solvent system would attack plastics.

Cells could be made with rounded sides, or may even be flexible to assume many shapes to promote circular motions of liquid impelled by low speed controlled paddles or propellers operating out of the light path. This form of construction could be designed to generate tornadoes of colour and allied effects. Magnetic stirrers could also be used for these effects.

As it is possible to remove the projection lens of many projectors the cell could be placed in the beam of light in front of the projector instead of in the gate, and the projection lens between the cell and the screen could be used to project an image of the illuminated cell onto the screen.

A better system would be to have a gate of non-corrodible plastics, for example, polypropylene, into which the cell would fit by

sliding in from the top. The cell would have a clip-on lid which would allow access to the interior of the cell with scrapers and pipettes, for example, for removing particles of dust, while the cell is still projected onto the screen.

As the cell slides into the gate the overflow could automatically plug into a waste bottle or container. It would be possible to have one side of the gate to close in at one end when the waste container has been removed so that a cell could not be fitted, thus avoiding flooding. Also, a float on the waste liquid could be made to trigger a visible or audible warning when the waste container is full.

#### WHAT I CLAIM IS:—

1. Apparatus for the production of varied colour effects comprising a cell of transparent material containing a body or film of liquid through which visible light can be projected and having a plurality of jet devices extending into the body of liquid, said devices being connectable to liquid supplies forming part of the apparatus such that a liquid or liquids different from the main liquid body in said cell can be forced to various points in the cell to effect localised changes in the chemical and/or physical condition of the body of liquid so as to produce varied colour effects.

2. Apparatus according to claim 1, wherein the cell is shaped to be suitable for adapting to an optical projector, e.g. a slide type projector so that coloured liquid phenomena may be projected on to a screen.

3. Apparatus according to claim 1 or 2, wherein the jet devices are connected by piping via pumping means to liquid supplies in

appropriate containers.

4. Apparatus according to claim 3, wherein said pumping means comprises devices for sucking liquid out of the cell and then blowing it back again.

5. Apparatus according to claims 3 or 4, including a console for controlling the pumping of the liquids.

6. Apparatus according to claim 3, 4 or 5 wherein the liquid(s) injected through the jet devices effect(s) changes in the hydrogen ion concentration (pH) value of part or the whole of the body of liquid.

7. Apparatus according to claim 3, 4 or 5, wherein the liquid(s) injected through said jet devices effect(s) localised changes in the density and refractive index of the body of liquid.

8. Apparatus according to claim 3, wherein said liquid supplies comprise alkali or acid solutions.

9. Apparatus according to claim 3 and 7, wherein the liquid supplies contain solutes chosen to raise or lower their density.

10. Apparatus according to claim 3, wherein said liquid supplies contain one or more pH sensitive compounds.

11. Apparatus for producing varied illumination effects when light is projected through a body or film of coloured liquid substantially as hereinbefore particularly described and as shown in the accompanying drawing.

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COMPLETE SPECIFICATION

1 SHEET

*This drawing is a reproduction of  
the Original on a reduced scale*

